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The Economic Consequences of Corporate Credit Rating Errors

Abstract

We show that errors by credit rating agencies can have significant real effects on rated firms. Specifically, we find that firms increase investment and adjust their capital structure following an exogenous correction to the credit rating adjustment process that occurred through the implementation of Financial Accounting Standards Board Statement No. 158 ("SFAS158"). Prior to SFAS158, Moody's and S&P did not correctly account for the presence of minimum liability adjustments for off-balance sheet pension obligations. Since neither firms nor the rating agencies were aware of this error, SFAS158 exogenously corrected the errors in the rating agency adjustments, thus allowing us to identify the effect of changes in credit rating labels independent of changes in firm fundamentals. We show that firms with higher minimum liability adjustments pre-SFAS158 are more likely to experience an improvement in credit rating post-SFAS158 relative to low minimum liability adjustment firms even though there is no detectable change in the credit quality of these firms relative to low minimum liability adjustment firms. In addition, firms with larger minimum liability adjustments are more likely to increase capital investment and shift capital structure toward debt financing post-SFAS158 relative to low minimum liability adjustment firms. Overall, our results indicate that credit rating errors have real economic consequences for rated firms because credit rating labels drive economic choices that are independent of firm fundamentals.

JEL classification: G24, G34, D43

Keywords: Corporate credit ratings, rating agency, off-balance-sheet finance, recognition, pension accounting, SFAS158

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1. Introduction

The traditional function of Credit Rating Agencies (CRAs) has been the independent certification of corporate creditworthiness. Given the quasi-regulatory role that ratings have assumed, ratings are expected to be accurate (e.g., Sufi, 2007). In the wake of the financial crisis, the apparent lack of accuracy was criticized due to the failures of structured finance products (e.g., see US Senate (2011), and US House (2008) for discussion of the CRAs' failures of ratings on mortgage-backed securities and collateralized debt obligations during the crisis). However, in response, the rating agencies suggested that this error was primarily due to a combination of unforeseen economic events and complicated modelling assumptions, and that such shortcomings do not have implications for their primary role as a gatekeeper for certifying corporate bonds. We challenge this position by providing evidence of systematic errors in the production of corporate credit ratings prior to the financial crisis that had consequences for firms' credit ratings. In addition, we show that the correction of this error had real economic effects on firms' level of investment and capital structure, consistent with the notion that credit rating labels influence real outcomes.

Credit rating agencies develop adjusted financial statements by modifying reported financial statements to reflect credit-relevant items not recognized under U.S. GAAP. Many of these adjustments arise because rating agencies treat off-balance sheet financing, such as defined benefit pension plans ("pension plans") or operating leases, as debt. Our study focuses on the implementation of Financial Accounting Standards Board Statement No. 158 ("SFAS158").[1] This statement requires that the overfunded or underfunded status of a firm's pension plan be

[1] The Financial Accounting Standards Board (FASB) adopted *SFAS158: Employers' Accounting for Defined Benefit Pension and Other Postretirement Plans*, an Amendment of FASB Statements Nos. 87, 88, 106, and 132(R) in September, 2006 (FASB (2006)). The standard became effective for fiscal years ending after December 15, 2006. The full statement is available at http://www.fasb.org/pdf/fas158.pdf.

recognized on its balance sheet. This information was previously disclosed in the notes to the financial statements. Thus, the standard generated no new financial information—it simply required the balance sheet recognition of a previously disclosed item. Prior to the implementation of SFAS158, there were potentially two pension liabilities, the Accrued Pension Cost and the Additional Minimum Liability ("AML"). Basu and Naughton (2017) find that the major credit rating agencies were only aware of the Accrued Pension Cost, and not the AML. As a result, the credit rating agency adjustments overstated the net pension liability by the amount of the AML, thus leading to higher values for adjusted leverage and lower corporate credit ratings. SFAS158 eliminated the AML, thus exogenously correcting the error in the rating agency adjustments. An illustration of the credit rating adjustments for pension plans using actual S&P data is shown in Figure 1, and is described in detail in Section 3.

SFAS158 is an effective setting to examine the economic consequences of changes in credit rating labels because the accounting standard change increases substantially the likelihood of a credit rating upgrade for firms with AML reporting requirements attributable to underfunded defined benefit pension plans. We empirically validate this conjecture by examining how firms' credit ratings and credit quality changed around the implementation of SFAS158. To ensure comparability across treatment and control firms, we focus our analyses on firms with pension plans and estimate the effects of the credit rating error by separating our sample into two groups based on the size of the pre-SFAS158 AML adjustment. We document that high AML firms experience a statistically significant rating upgrade of 0.33 notches relative to low AML firms. We also document that the probability that a firm receives an upgrade is discontinuous based on the size of the pre-SFAS158 AML adjustment. High AML firms have a 29.2% chance of obtaining an upgrade during the year, compared with only 22.5% for low AML firms.

Conversely, high AML firms have only a 33.1% chance of obtaining a downgrade during the year, compared with 37.9% for low AML firms. We find no statistically significant difference with regard to changes in CDS spreads and hence credit quality of the high versus low AML firms around the implementation of SFAS158. As a result, the differences in credit rating changes do not appear to be driven by changes in firm fundamentals, but rather are a function of a correction to the credit rating process.

Next, we examine how the correction to the rating agency process affected firm investment and financial policy using a difference-in-difference framework that compares the change for high AML firms to the change for low AML firms around the implementation of SFAS158. Across a variety of measures, we find that high AML firms increased corporate investment following SFAS158. This result is shown graphically in Figure 2 for capital expenditure. This figure shows that the average level of investment for high and low AML firms moves roughly in sync prior to the implementation of SFAS158, at which point the lines substantially converge. This figure and additional robustness tests that consider different time periods indicate that the effect of the change in credit rating labels that was caused by the correction in the rating agency adjustments had a fairly rapid effect on investment, and that the effect was relatively permanent. We find similar results when we examine changes in firms' financial policies. We find a statistically significant increase in the use of long term debt, but no statistically significant change in equity issuance. In addition, we find that high AML firms were raising more capital relative to low AML firms. Collectively, our results suggest that changes in credit rating labels led to changes in corporate investment and financial policy.

Our study contributes to the literature in several ways. Our main contribution is to the literature that examines the effects of credit ratings on firm outcomes. This line of research has

found that credit ratings are important determinants of a firm's capital structure (e.g., Sufi 2007; Kisgen, 2009) and its cost of capital (Beatty and Weber, 2003; Kisgen and Strahan, 2010). Many of these prior studies are subject to omitted variables concerns because changes in ratings are correlated with changes in firm fundamentals. The SFAS158 setting allows us to examine more precisely whether rating changes affect firm investment and financial policy even when those rating changes are not driven by changes in firm fundamentals. As a result, we provide evidence that the changes in the credit rating label, independent of firm fundamentals, is associated with changes in firm investment and financial policy.

We also contribute more broadly to the credit rating literature by documenting the economic consequences of errors in the production of *corporate* credit ratings in the pre-financial crisis period. Prior studies have investigated the accuracy of *issue* credit ratings for mortgage-backed securities (MBSs) and collateralized debt obligations (CDOs), in part because of the prominent role that the underestimation of default risk for these instruments played in the financial crisis (e.g., deHaan, 2016). We document similar failings with respect to corporate credit ratings by showing that rating agencies did not accurately complete financial statement adjustments for pension obligations.

This paper proceeds as follows. In Section 2, we summarize the literature and state our hypothesis. Section 3 summarizes our data collection and describes the SFAS158 setting. The results of our analyses are provided in Section 4, followed by our conclusions in Section 5.

2. Literature Review and Hypothesis Development

In the credit rating literature, a significant body of research examines the determinants of credit ratings. These studies have shown that financial ratios and accounting variables such as

leverage, liquidity, accrual quality, earnings timeliness, and firm size are all determinants of a firm's credit rating (e.g. Ederington, 1985; Blume et al., 1998; Kamstra et al., 2001; Ashbaugh-Skaife et al., 2006). A number of studies have also investigated how credit ratings change over time. For example, Amato and Furfine (2004) find that macroeconomic factors, such as GDP growth, influence credit ratings. Baghai et al. (2014) also find that rating agencies have become more conservative in assigning corporate credit ratings over the 1985 to 2009 period. deHaan (2016) finds that the performance of corporate credit ratings improved after the financial crisis.

A number of papers have also investigated whether the structure of the credit rating market induces biased ratings. This research has generally found that investor-paid rating agencies produce higher quality and lower ratings than issuer-paid rating agencies (Beaver et al., 2006; Cornaggia and Cornaggia, 2013; Jiang et al., 2012) and that issuer pay rating agencies bias their ratings (Griffin and Tang, 2011; Bolton et al., 2012; He et al., 2012; Opp et al., 2013). Becker and Milbourn (2011) examine how the ratings quality of incumbent rating agencies responds to the entry of a new rating agency. They find that when Fitch entered the market, the ratings quality of the incumbents (i.e., Moody's and S&P) decreased.

A smaller number of studies have investigated how regulatory changes affect credit ratings. Jorion, Liu, and Shi (2005) find that the information content of both credit rating downgrades and upgrades is greater following the passage of Regulation Fair Disclosure (FD). Cheng and Neamtiu (2009) find that following the passage of the Sarbanes-Oxley Act in 2002, rating agencies not only improved rating timeliness, but also increased rating accuracy and reduced rating volatility. Dimitrov et al. (2015) analyzes the impact of the Dodd-Frank Act on corporate bond ratings. They find no evidence that the Dodd-Frank Act disciplines rating agencies to provide more accurate and informative credit ratings.

The area of research that this study most closely resembles is the area that examines the real consequences of credit ratings. This line of research has found that credit ratings are important determinants of a firm's capital structure (e.g., Sufi 2007; Kisgen, 2009) and its cost of capital (Beatty and Weber, 2003; Kisgen and Strahan, 2010). In addition, credit ratings are used in federal and state legislation, in capital adequacy rules issued by regulators, and in corporate debt contracts. The regulatory requirement that certain categories of institutional investors rely on ratings for their investment decisions has given rise to regulatory arbitrage, whereby investors derive benefits from the rating label itself as opposed to the actual informativeness of the rating (e.g., Partnoy, 1999; Opp, Opp, and Harris 2013). Prior research has also shown that credit rating announcements generate investor reactions via bond and stock prices, and that the reaction is greater for credit rating downgrades than for upgrades (e.g., Holthausen and Leftwich, 1986; Hand, Holthausen, and Leftwich, 1992; Dichev and Piotroski, 2001).

Unlike this study, many of these prior studies are subject to omitted variables concerns because changes in ratings are correlated with changes in firm fundamentals. The SFAS158 setting allows us to examine more precisely whether rating changes affect firm investment and financial policy even when those rating changes are not driven by changes in firm fundamentals. In this respect, our study is closely related to Almeida et al. (2007) who document the sovereign channel through which credit rating labels influence firm investment and capital structure. The main challenge in using the sovereign ceiling rule setting is the connection between the creditworthiness of firms in downgraded countries and the overall credit quality of those countries. To address this challenge, Almeida et al. (2017) adopt an empirical strategy that compares firm-years where the credit rating downgrade is more likely to be driven by the sovereign ceiling rule rather than firm fundamentals to other firm-years. Using this strategy,

Almeida et al. (2017) document that credit rating declines are associated with a decline in investment and decreased debt issuance.

Our study complements Almeida et al. (2017) by examining another mechanism through which credit ratings can change without concurrent changes in firm fundamentals. Unlike the sovereign ceiling setting, the SFAS158 setting focuses on a large sample of US firms and on a correction that generates credit rating upgrades rather than downgrades. In addition, we do not have to control for macroeconomic effects as the credit rating changes our study focuses on are not due to a sovereign rule effect, but rather the correction of a rating agency error. Since neither the rating agencies nor the firms appeared to be aware of the error, we suggest that this allows us to make causal statements about how exogenous credit rating upgrades influence firm investment. We focus on two hypotheses, which we state in null form:

H1: The correction of errors in the rating process has no effect on firm investment.

H2: The correction of errors in the rating process has no effect on firm financial policy.

The tension in our line of research hinges on the sophistication of markets and firms with respect to credit rating changes. To the extent that firms only respond to changes in credit quality, then there should be no change in either firm investment or financial policy in response to an exogenous credit rating upgrade. In contrast, if firms do base investment and financial policy decisions, in part, on the firm's corporate credit rating, then there will be changes in both in response to an exogenous credit rating upgrade. If so, we would expect that a higher credit rating will result in higher levels of investment and a net increase in debt issuance.

3. Description of Setting and Sample Selection

We exploit SFAS158, which generated exogenous improvements in credit ratings for firms with Additional Minimum Liability ("AML") reporting requirements under the prior accounting regime (Basu and Naughton, 2017). Prior to the implementation of SFAS158, there were potentially two liabilities, the Accrued Pension Cost and the AML. The latter liability only exists for firms with pension plans that are underfunded on an accrued basis. Basu and Naughton (2017) find that the major credit rating agencies were only aware of the Accrued Pension Cost, and not the AML. As a result, the credit rating agency adjustments overstated the net pension liability by the amount of the AML pre-SFAS158.

An illustration of the S&P adjustment process for two sample firms is provided in Figure 1. This figure shows the determination of the recognized pension liability on the unadjusted and adjusted financial statements for the year prior to and the year of SFAS158 implementation. As outlined in more detail in Basu and Naughton (2017), the intended goal of the rating agency adjustments was to record a pension liability equal to the funding deficit on a Projected Benefit Obligation basis. In Figure 1, however, the pension liability recognized on the adjusted financial statements exceeds this amount pre-SFAS158, but is exactly equal to it post-SFAS158. For example, Colgate has a funding deficit of $504 million as well as a recognized pension liability of $504 million on both the unadjusted and adjusted financial statements for 2006. In contrast, it has a recognized pension liability of $799 million on the adjusted financial statements for 2005, which exceeds both the recognized pension liability on the unadjusted financial statements of $361 million and the funding deficit of $528 million. For this example, it is difficult to argue that the pension liability on the adjusted financial statements ($799 million) should exceed the funding deficit ($528 million) for 2005. Moreover, it seems more than coincidental that the

excess difference is driven by an S&P liability adjustment ($438 million) that is very close to the additional minimum liability adjustment ($474 million).

SFAS158 eliminated the AML adjustment by requiring that the total unfunded liability on a projected benefit obligation basis be recognized, thus automatically correcting the error in the rating agency adjustments. Basu and Naughton (2017) interviewed credit rating personal and reviewed internal documents to establish that neither S&P nor Moody's was aware of this error. In addition, neither agency examined changes in credit ratings for firms affected by SFAS158 which would have potentially shed light on the error. We follow other studies (e.g., Adelino and Ferreira, 2016) and focus on S&P's ratings history over other agencies' history because S&P tends both to be more active in making ratings revisions and to lead other agencies in re-rating (Kaminsky and Schmukler, 2002). In addition, ratings announcements by S&P also seem to convey a greater own-country stock market impact and seem not to be fully anticipated by the market (Reisen and von Maltzan, 1999).

We start with all US firms with non-missing long-term issuer credit ratings in the S&P Capital IQ database for the period 2004 to 2009. We merge these firms with the Fundamental File and Pension Item in Compustat. We eliminate firms that do not have pension plans, as our empirical approach relies on the magnitude of the AML, which is an accounting item that only exists for firms with pension plans. We also want to ensure that our treatment and control firms are similar, and we believe this is best achieved by focusing on firms with pension plans. We exclude all financial institutions (SIC codes "60-69"), utilities (SIC codes "49"), and governmental enterprises (SIC codes that begin with "9"). The resulting sample consists of 7,625 firm-quarters from 360 unique firms, all of which sponsor a pension plan.

We control for items that prior research has shown influence either the level of investment or the credit worthiness of the firm. The specific control variables we use are: *DEBTCOV* (sum of long-term debt and debt in current liabilities scaled by EBITDA. If this number is negative, we set it equal to zero), *NEG_DEBTCOV* (indicator variable equals to one if *DEBTCOV* is negative, and zero otherwise),[2] *RENT* (rental payments divided by total assets), *CASH FLOW* (cash and short-term investments divided by total assets), *INTCOV* (EBITDA divided by net interest paid), *PROFIT* (EBITDA divided by sales), *PROFITVOL* (standard deviation of *PROFIT* over the last five years, or at least the last two years if data is not available for the last five years), *SIZE* (log of total assets), *LEVERAGE* (long-term debt plus debt in current liabilities divided by total assets), *TANGIBILITY* (net property, plant, and equipment divided by total assets), and *CAPEX* (capital expenditures divided by total assets). Summary statistics for these variables are provided in Table 2.

We use the SFAS158 setting to test the effect of credit rating labels on investment and financial policy by exploiting the fact that the correction to the rating process generated by SFAS158 is exogenous to firm fundamentals, and the probability that a corporate issuer will obtain a rating upgrade following the implementation of SFAS158 is discontinuous based on the size of the pre-SFAS158 AML reporting requirement. Our treatment firms are those with an AML above the median for all the firms in our sample (*HIGHAML*=1) and the remaining firms are the control firms (*LOWAML*=1). Across these two groups of firms, our data indicates that there is a significant difference in how credit ratings responded in the year SFAS158 was effective.

[2] We do not allow DEBTCOV to be negative because large ratios of debt to EBITDA increases default risk while small ratios decrease default risk. When EBITDA is negative, the ratio becomes negative, while default risk actually increases further. Because we limit DEBTCOV to be positive, we capture the effect of negative values with the binary indicator variable NEG_DEBTCOV.

In Table 3 Panel A, we report the percentage of *HIGHAML* and *LOWAML* firms in our sample that experience a credit rating upgrade, no change in credit rating, or a credit rating downgrade during a sovereign downgrade year. *HIGHAML* firms have a 29.2% chance of obtaining an upgrade during the year, compared with only 22.5% for *LOWAML* firms. Conversely, *HIGHAML* firms have only a 33.1% chance of obtaining a downgrade during the year, compared with 37.9% for *LOWAML* firms. Overall, Table 3 Panel A shows that the credit rating of *HIGHAML* firms relative to *LOWAML* firms increases by approximately one-third of a notch in response to SFAS158. Importantly, the analyses of the CDS spreads in Panel B indicate that even though there is a difference with regard to changes in credit ratings, there is no difference with regard to changes in CDS spreads and hence credit quality.

4. Research Design and Results

We examine the effect of changes in credit rating labels on investment using the following difference-in-differences specification:

$$INVEST_{i,t} = \alpha + \beta_1 POST*HIGHAML_{i,t} + \sum \gamma_j Controls + Fixed\ Effects + \varepsilon_{i,t} \quad (1)$$

HIGHAML is an indicator variable that takes the value of one for firms whose average additional minimum liability scaled by total assets pre-SFAS158 is above the median of the firms in our sample. This variable identifies those firms where the probability of an upgrade generated by the rating agency correction is highest (Basu and Naughton, 2017). *POST* is an indicator variable that takes the value of one for firm-quarters after the implementation of SFAS158 (i.e., calendar year 2007).

We use four different variables to proxy for investment behavior: *CAPEX* equals firms' capital expenditure, which is calculated as the change in firms' property, plant, and equipment

plus depreciation and scaled by lagged total assets. *CASH ACCUMULATION* equals the change in firms' cash and cash equivalents and scaled by lagged total assets. *ASSET GROWTH* equals the change in firm's book value of total assets and scaled by lagged total assets. *INVEST* is the change in NOA scaled by average total assets. Change in NOA is calculated as change in non-cash assets minus the change in non-debt liabilities; non-cash assets is calculated as total assets minus cash and short-term investments; non-debt liabilities is calculated as total liabilities plus minority interest less debt. We control for various factors identified in prior research as determinants of firm investment and credit worthiness. These control variables are described in Section 3. We include firm fixed effects to control for time-invariant unobserved correlated variables. We also include year-fixed effects to capture the influence of aggregate time-series trend. We cluster all the standard errors by firm.

The coefficient of interest in equation (1) is β_1, the coefficient on the interaction term *HIGHAML*POST*. This coefficient captures the difference in the change in investment behavior between the treatment firms (i.e., those firms with a higher probability of a rating upgrade in response to the SFAS158) and the control firms (i.e., those firms with a lower probability of a rating upgrade in response to the SFAS158). To the extent that an exogenous credit rating upgrade leads to a decrease (increase) in investment, we expect $\beta_1 < 0$ ($\beta_1 > 0$). To the extent that an exogenous credit rating upgrade leads to a decrease (increase) in cash accumulation, we expect $\beta_1 > 0$ ($\beta_1 < 0$).

The results from equation (1) are presented in Table 4. The coefficient β_1 is statistically significant in each specification. In column (1), the coefficient indicates that there was a statistically significant increase in CAPEX for HIGHAML firms relative to LOWAML firms. The results are similar across the other specifications. Column (2) indicates that HIGHAML

firms held less cash than LOWAML firms, column (3) indicates that HIGHAML firms experienced a differential increase in the book value of assets relative to LOWAML firms, and column (4) indicates that HIGHAML firms increased investment relative to LOWAML firms. Collectively, these results suggest that the correction in the credit rating methodology led to meaningful changes in the level of investment at affected firms.

The analyses in Table 4 compare 3 years of pre-SFAS158 data with 3 years of post-SFAS158 data. In Table 5, we confirm that our results are not driven by this research design choice. We consider three other time periods: 2004—2007, which allows us to identify whether the change in investment occurred immediately following the implementation of SFAS158; 2002—2014, which allows us to identify whether the change in investment was present over a longer time period; and 2002—2004 without the financial crisis years of 2007 and 2008 to ensure that our findings are not driven by the unusual economic activity during the financial crisis. For brevity, we only show the results using CAPEX. In each specification, the coefficient on the HIGHAML*POST interaction term is positive and significant, and also close in magnitude to the corresponding coefficient in Table 4, column (1). Collectively, these results suggest that our conclusions are not sensitive to the time period studied.

Next, we examine whether there are also effects on firms' financial policy, and in particular, whether there is a change in firms' use of debt. We examine the effect of changes in credit rating labels on financial policy using the following difference-in-differences specification:

$$POLICY_{i,t} = \alpha + \beta_1 POST*HIGHAML_{i,t} + \sum \gamma_j Controls + Fixed\ Effects + \varepsilon_{i,t} \qquad (2)$$

All independent variables and the fixed effect structure are the same as those used in equation (1). We proxy for firms' financial policy using four different variables: *NET DEBT*

ISSUANCE, which is equal to long-term debt issuance minus long-term debt reduction; *NET EQUITY ISSUANCE* , which is equal to the sale of common and preferred stock minus purchases of common and preferred stock; *NET DEBT LESS EQUITY*, which is equal to the difference in the prior two variables; and *SHORT TERM DEBT*, which is equal to short term debt issuance scaled by lagged total assets.

Once again, the coefficient of interest in equation (1) is β_1, the coefficient on the interaction term *HIGHAML*POST*. This coefficient captures the difference in the change in financial policy between the treatment firms (i.e., those firms with a higher probability of a rating upgrade in response to the SFAS158) and the control firms (i.e., those firms with a lower probability of a rating upgrade in response to the SFAS158). To the extent that an exogenous credit rating upgrade leads to an increase (decrease) in the use of debt, we expect $\beta_1 > 0$ ($\beta_1 < 0$).

The results from equation (2) are presented in Table 5. The coefficient β_1 is statistically significant in each specification that considers the firm's use of debt (i.e., columns (1), (3) and (4)). In column (1), the coefficient indicates that there was a statistically significant increase in the use of long term debt. In contrast, the coefficient in column (2) indicates that there was no statistically detectable change in equity issuance. Collectively, these two results suggest that HIGHAML firms did not adjust their use of equity financing, but did increase their use of debt financing relative to LOWAML firms. The results in columns (3) and (4) provide additional support for this conclusion. The coefficient on the difference between debt and equity financing is also positive, indicating that in total, HIGHAML firms were raising more capital relative to LOWAML firms. The results in column (4) indicate that these firms were also increasing their use of short term debt.

5. Conclusion

We show that errors by credit rating agencies can have significant real effects on rated firms. We show that HIGHAML firms are more likely to experience an improvement in credit rating post-SFAS158 relative to LOWAML firms even though there is no detectable change in the credit quality of these firms relative to LOWAML firms. In addition, HIGHAML firms are more likely to increase capital investment and shift capital structure toward debt financing post-SFAS158 relative to LOWAML firms. Overall, our results indicate that credit rating errors have real economic consequences for rated firms because credit rating labels drive economic choices that are independent of firm fundamentals.

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Appendix A: Variable Definitions

Variable	Description	Data Source
Panel A: Dependent Variables		
CAPEX	Firms' capital expenditure, which is calculated as the change in firms' property, plant, and equipment plus depreciation and scaled by lagged total assets	Compustat
CASH ACCUMULATION	Change in firms' cash and cash equivalents and scaled by lagged total assets	Compustat
ASSET GROWTH	Change in firm's book value of total assets and scaled by lagged total assets	
NET DEBT ISSUANCE	Long-term debt issuance minus long-term debt reduction	Compustat
NET EQUITY ISSUANCE	Sale of common and preferred stock minus purchases of common and preferred stock	Compustat
SHORT TERM DEBT	Short term debt issuance scaled by lagged total assets	Compustat
INVEST	Change in NOA scaled by average total assets. Change in NOA is calculated as change in non-cash assets minus the change in non-debt liabilities; non-cash assets is calculated as total assets minus cash and short-term investments; non-debt liabilities is calculated as total liabilities plus minority interest less debt	Compustat
Panel B: Pension Accounting Variables		
PBPRO	Projected Benefit Obligation	Compustat
PPLAO	Pension Assets	Compustat
S87AML	S87AML is the additional minimum liability prior to SFAS158 scaled by total assets. Liabilities are recorded as negative values.	Compustat
HIGH (LOW) AML	Indicator variable set to one for firms where the size of the firm's Additional Minimum Liability adjustment pre-SFAS158 (S87AML) is above (below) the sample median (see Basu and Naughton, 2017)	Constructed
POST	An indicator variable that takes the value of one for fiscal quarters that end after December 31, 2006 and before December 31, 2009; and takes the value of zero for fiscal quarters that end after December 31, 2004 and before December 31, 2006	Constructed
Panel C: Firm-Level Determinants of Investments		
SIZE	Log of assets (ATQ)	Compustat
LEVERAGE	Sum of Long-term (DLTTQ) and short-term debt (DLCQ) over Total Assets (ATQ)),	Compustat
ROA	Net Income (NIQ) over Total Assets (ATQ)	Compustat
MTB	Ratio of market value of equity divided by book value of equity	Compustat
TANGIBILITY	Net property, plant, and equipment (PPENT) over assets (ATQ)	Compustat

Variable	Description	Data Source
Panel D: Other Controls		
Pension Assets	Pension Assets (PPLAO) divided by Total Assets (AT)	Compustat
RENT	Rental payments (XRENT) divided by assets (AT), measured at the end of fiscal year *t*	Compustat
INTCOV	EBITDA (OIBDPQ) over net interest expense (XINTQ)	Compustat
PROFITVOL	Standard deviation of ROA over the last five years, or at least the last two years if insufficient data	Compustat
DEBTCOV	Sum of Long-term (DLTTQ) and short-term debt (DLCQ) over EBITDA (OIBDP)), or zero if ratio is negative for fiscal quarter *t*	Compustat
NegDEBTCOV	Equals 1 if DEBTCOV is negative	Compustat
Panel D: Credit Variables		
S&P RATING	Standard & Poor's Domestic Long-Term Issuer Credit Rating (SPLTICRM) issued three months after the end of year t, translated into a numerical scale by adding one for each rating notch. Thus, a AAA rating becomes 1, AA+ becomes 2, AA becomes 3, etc., up to a score of 21 for a rating of C.	WRDS
CDS_Spread	Average daily five-year CDS spread (measured in basis points) in a given fiscal year	Markit

Figure 1: Comparison of Recognized Pension Liability with S&P Adjustment

This figure illustrates the calculation of each pension variable used in our analyses. The data are for the 2005 and 2006 fiscal years (i.e., the year prior to and the year of the implementation of SFAS158). Liabilities are shown as negative numbers (i.e., in parentheses). The last two items show that the total pension liability on the S&P adjusted financial statements is greater than the total unfunded projected benefit obligation for each of these example firms for the 2005 fiscal year but not for the 2006 fiscal year.

Variable	**Description**	**Source/Calculation**		**Example 1**		**Example 2**
conm	Company Name	*Compustat*		**3M CO**		**COLGATE**
gvkey	GVKEY	*Compustat*		7435		3170
fyear	Fiscal year	*Compustat*	**2005**	**2006**	**2005**	**2006**
pbaco	Accumulated Benefit Obligation	*Compustat*	(12,716)	(13,316)	(1,954)	(2,127)
pbpro	Projected Benefit Obligation	*Compustat*	(13,936)	(14,599)	(2,121)	(2,302)
pplao	Pension Assets	*Compustat*	12,625	14,030	1,593	1,798
pcupso	Unrecognized Prior Service Cost	*Compustat*	7	(1)	0	0
poajo	Other Adjustments	*Compustat*	3,636	2,929	641	551
pcppao	(Accrued)/Prepaid Pension Cost	*Compustat*	2,332	2,359	113	47
S87_MIN	Minimum Liability	*min(0,pplao+pbaco)*	(91)	0	(361)	(329)
S87_AML	Additional Minimum Liability	*if S87_MIN ≠ 0, S87_MIN - pcppao*	(2,423)	0	(474)	(376)
S87_REC	Total Pension (Liability)/Asset under SFAS87	*S87_AML + pcppao*	(91)	2,359	(361)	(329)
S158_REC	Total Pension (Liability)/Asset under SFAS158	*pplao + pbpro*	(1,311)	(569)	(528)	(504)
S158_ADDL	Additional Pension (Liability)/Asset due to SFAS158	*S158_REC - S87_REC*	(1,220)	(2,928)	(167)	(175)
	Total Pension (Liability)/Asset on Unadjusted Financial Statements	*S87_REC or S158_REC*	(91)	(569)	(361)	(504)
SP_PEN_ ADJ	Total Pension S&P Adjustment	*CreditStats Direct*	(2,706)	0	(438)	0
	Total Pension (Liability)/Asset on S&P Adjusted Financial Statements	*Pension_REC + SP_ADJ*	(2,797)	(569)	(799)	(504)
DB_ FUNDING	Pension Funding (Deficit)/Surplus on PBO Basis	*pplao + pbpro*	(1,311)	(569)	(528)	(504)

Figure 2: Illustration of Time Series Changes in Firm Investment

This figure illustrates the time series variation in firm investment for HIGHAML versus LOWAML firms around the adoption of SFAS158. LOWAML firms have higher levels of investment than HIGHAML firms prior to SFAS158, and this difference narrows in the post-SFAS158 period.

Times Series of Firm Investment (*CAPEX* Variable)

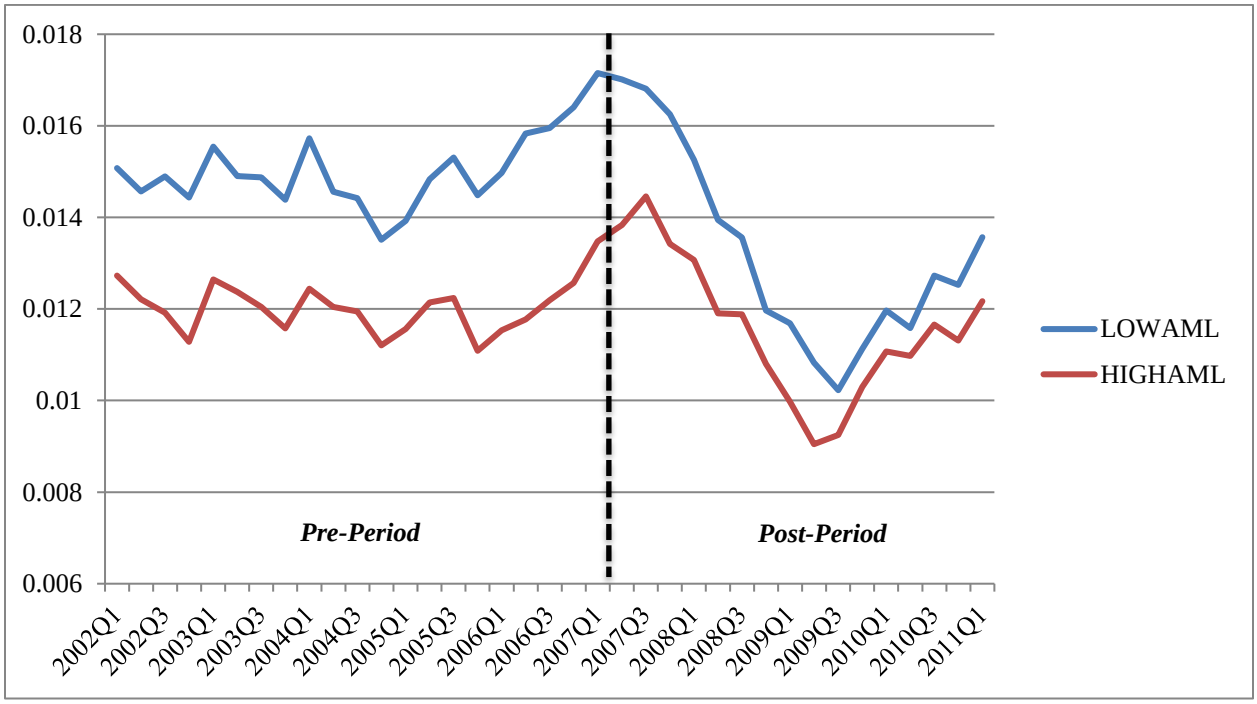

Table 1: Sample Composition by Industry

Fama-French 12 Industries Code	*Unique Firms*	*Firm-Quarters*
Consumer NonDurables -- Food, Tobacco	38	882
Consumer Durables -- Cars, TV's, Furniture	23	470
Manufacturing -- Machinery, Trucks, Plants	111	2,209
Oil, Gas, and Coal Extraction and Products	29	688
Chemicals and Allied Products	40	840
Business Equipment -- Computers, Software	32	707
Wholesale, Retail, and Some Services	38	792
Healthcare, Medical Equipment, and Drug	24	506
Other -- Mines, Constr, BldMt, Trans	25	531
Total	360	7,625

This table presents the breakdown of the sample based on industry classification as per 12 digit Fama-French Indicators.

Table 2: Descriptive Statistics for Variables Used in the Regression Analyses

Variable	*N*	*Mean*	*Std. Dev.*	*P25*	*Median*	*P75*
Dependent Variables:						
CAPEX	7,625	0.014	0.022	0.005	0.01	0.018
CASH ACCUMULATION	8,006	0.001	0.059	-0.014	0.002	0.022
ASSET GROWTH	7,977	0.017	0.082	-0.014	0.011	0.036
NET DEBT ISSUANCE	6,847	0.002	0.039	-0.007	0	0.001
NET EQUITY ISSUANCE	7,208	-0.006	0.014	-0.005	0	0
SHORT TERM DEBT	7,854	0.032	0.046	0.002	0.014	0.046
INVEST	7,803	0.007	0.106	-0.029	0.005	0.036
Control Variables:						
SIZE	8,006	8.426	1.275	7.577	8.328	9.297
LEVERAGE	8,006	0.283	0.161	0.177	0.262	0.366
ROA	8,006	0.012	0.024	0.004	0.013	0.022
MTB	8,006	0.492	0.397	0.272	0.429	0.641
TANGIBILITY	8,006	0.29	0.195	0.141	0.237	0.398
DEBTCOV	8,006	16.355	24.864	4.447	8.087	14.843
Neg.DEBTCOV	8,006	0.026	0.158	0	0	0
RENT	8,006	0.016	0.024	0.006	0.01	0.016
PROFITVOL	8,006	0.01	0.017	0.002	0.005	0.012
INTCOV	8,006	14.534	24.962	4.436	8.846	15.619
PENSION ASSETS	8,006	0.137	0.159	0.026	0.086	0.183
Rating Variables:						
RATING	7,918	10.209	3.13	8	10	13
5-yr CDS Spread	4,763	1.746	4.656	0.338	0.672	1.758

This table presents descriptive statistics for the variables used in the regression analyses. All variables are defined in Appendix A.

Table 3: Validation of SFAS158 Setting

Panel A: Ex-post Changes in Credit Ratings in the year 2007

		Long-term Credit Ratings		
		Pre-SFAS158	Post-SFAS158	
		(a)	(b)	(b)-(a)
HIGHAML	(i)	9.90 *N=2,059*	9.99 *N=676*	0.09
LOWAML	(ii)	10.28 *N=1,180*	10.71 *N=682*	0.42***
	(i)-(ii)	(0.38)	(0.72)**	(0.33)**

		% (Count) Of firms that experienced credit ratings changes in the year 2007		
		# Upgrades	# No Change	# Downgrades
		(a)	(b)	(c)
HIGHAML	(i)	29.2% *N=52*	37.6% *N=67*	33.1% *N=59*
LOWAML	(ii)	22.5% *N=41*	39.6% *N=72*	37.9% N=69

Panel B: Ex-post Changes in CDS Spreads in the year 2007

		5-Year CDS Spreads		
		Pre-SFAS158	Post-SFAS158	
		(a)	(b)	(b)-(a)
HIGHAML	(i)	1.04 *N=1,215*	1.05 *N=431*	0.01
LOWAML	(ii)	1.03 *N=2,027*	1.11 *N=399*	0.08
	(i)-(ii)	(0.01)	(0.06)	(0.07)

HIGHAML (*LOWAML*) is an indicator variable set to one for firms where the size of the firm's Additional Minimum Liability adjustment pre-SFAS158 is above (below) the sample median (see Basu and Naughton, 2017). We transform the categorical long-term credit ratings in to a continuous measure where higher value represents lower ratings. Panel A presents the ex-post changes in credit ratings for the high (low) AML samples around SFAS158 implementation Panel B presents the ex-post changes in 5-year CDS spreads for the high (low) AML samples around SFAS158 implementation.

Table 4: Change in Corporate Investment

Results from an OLS estimation of Corporate Investment behavior on HIGHAML. Column (1), (2), (3) and (4) presents the effect of HIGHAML on CAPEX, Change in Cash, Asset Growth and Investment respectively. HIGAML is a binary variable that takes the value of 1 if the firm's Additional Minimum Liability adjustment pre-SFAS158 (S87AML) is above the sample median and 0 otherwise. The sample consists of 360 firms from 2004-2009. A positive coefficient on *HIGHAML*Post* indicates that firms with high AML experienced, on average, an increase in that dependent variable in the post period. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests and standard errors clustered by firm. All variables are defined in Appendix A.

	(1) *CAPEX= (ΔPPE + DEP)/Lag.AT*	(2) *ΔCASH*	(3) *ASSET GROWTH*	(4) *INVEST = ΔNOA/0.5(AT + Lag AT)*
HIGHAML*POST	0.004***	-0.010**	0.014***	0.012***
	(3.216)	(2.049)	(3.118)	(2.833)
Rating Controls				
SIZE	0.010***	-0.013	0.048***	0.048***
	(4.609)	(1.446)	(8.538)	(7.201)
MTB	-0.002	-0.010**	-0.008	-0.006
	(1.331)	(2.222)	(1.554)	(1.035)
LEVERAGE	0.012**	-0.026	0.109***	0.142***
	(2.384)	(1.316)	(5.527)	(5.113)
ROA	0.101***	-0.017	0.898***	0.798***
	(5.180)	(0.352)	(12.785)	(8.220)
DEBTCOV	-0.000	-0.000	-0.000	-0.000
	(0.581)	(0.381)	(0.186)	(0.009)
NegDEBTCOV	-0.002	-0.006	0.002	0.022*
	(0.870)	(0.749)	(0.190)	(1.888)
RENT	0.088	1.070**	0.420	0.808**
	(1.335)	(2.152)	(1.603)	(2.220)
PROFITVOL	-0.031	0.108	-0.061	-0.079
	(0.675)	(0.761)	(0.558)	(0.535)
INTCOV	0.000***	-0.000	0.000	0.000**
	(3.010)	(0.948)	(1.225)	(2.436)
TANGIBILITY	0.071***	-0.197***	-0.078***	-0.002
	(5.206)	(3.945)	(3.029)	(0.061)
PENSION ASSETS	-0.019**	-0.053	-0.091***	-0.066*
	(2.315)	(1.279)	(3.086)	(1.682)
Number of Firm-Qtrs.	7,629	8,010	7,981	7,803
Adjusted R-squared	0.230	0.077	0.147	0.057
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Table 5: Change in Corporate Investment over Various Sample Periods

Results from an OLS estimation of Corporate Investment behavior on HIGHAML. Column (1), (2), (3) presents the effect of HIGHAML on CAPEX for the vintages 2004-2007, 2002-2014 and 2002-2014 excluding the 2007-2008 financial crisis years. HIGAML is a binary variable that takes the value of 1 if the firm's Additional Minimum Liability adjustment pre-SFAS158 (S87AML) is above the sample median and 0 otherwise. The sample consists of 360 firms from 2004-2009. A positive coefficient on *HIGHAML*Post* indicates that firms with high AML experienced, on average, an increase in corporate investment in the post period. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests and standard errors clustered by firm. All variables are defined in Appendix: A

	(1) *(2004-2007)*	*(2)* *(2002-2014)*	*(3)* *2002-2014 (Excluding Crisis-Years)*
HIGHAML*Post	0.005***	0.003***	0.003***
	(2.930)	(2.997)	(2.791)
Rating Controls			
SIZE	0.021***	0.005***	0.005***
	(7.955)	(5.066)	(4.685)
MTB	-0.002	-0.004***	-0.005***
	(0.828)	(3.661)	(4.150)
LEVERAGE	0.023***	0.002	0.003
	(3.104)	(0.570)	(0.677)
ROA	0.090***	0.109***	0.114***
	(3.460)	(7.668)	(6.989)
DEBTCOV	0.000	-0.000	-0.000
	(1.527)	(1.352)	(0.695)
NegDEBTCOV	0.007**	-0.002	-0.002
	(2.053)	(1.026)	(0.621)
RENT	0.088	0.027	0.010
	(0.800)	(0.648)	(0.214)
PROFITVOL	0.038	-0.060**	-0.059**
	(0.837)	(2.433)	(2.241)
INTCOV	0.000***	0.000**	0.000**
	(2.913)	(2.482)	(2.391)
TANGIBILITY	0.132***	0.039***	0.036***
	(10.207)	(5.637)	(4.360)
PENSION ASSETS	-0.038**	-0.009*	-0.010**
	(1.970)	(1.963)	(2.014)
Number of Firms	5,219	15,074	11,702
Adjusted R-squared	0.278	0.195	0.190
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes

Table 6: Change in Financial Policy

Results from an OLS estimation of Corporate Financing behavior on HIGHAML. Column (1), (2), (3), (4) presents the effect of HIGHAML on Net Debt Issuance, Net Equity Issuance, Net Debt less Equity and Short term Debt respectively. HIGAML is a binary variable that takes the value of 1 if the firm's Additional Minimum Liability adjustment pre-SFAS158 (S87AML) is above the sample median and 0 otherwise. The sample consists of 360 firms from 2004-2009. A positive coefficient on *HIGHAML*Post* indicates that firms with high AML experienced, on average, an increase in the dependent variable in the post period. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively, using two-tailed tests and standard errors clustered by firm. All variables are defined in Appendix A.

	(1) Net Debt Issue-Long Term	(2) Net Equity Issue	(3) Debt - Equity	(4) Short Term Debt
HIGHAML*Post	0.006***	0.001	0.006**	0.009***
	(2.872)	(0.856)	(2.507)	(2.599)
Rating Controls				
SIZE	0.018***	0.000	0.018***	0.008
	(5.911)	(0.400)	(5.463)	(1.629)
MTB	0.000	0.001***	-0.002	-0.006**
	(0.015)	(2.803)	(0.738)	(2.566)
LEVERAGE	0.108***	0.001	0.116***	0.128***
	(8.627)	(0.488)	(8.025)	(6.412)
ROA	-0.022	-0.055***	0.034	-0.017
	(0.721)	(6.083)	(0.948)	(0.664)
DEBTCOV	0.000**	-0.000	0.000*	-0.000
	(2.084)	(1.068)	(1.901)	(1.484)
NegDEBTCOV	0.007	-0.002***	0.011**	0.005
	(1.382)	(2.601)	(2.117)	(0.862)
RENT	0.144	0.063	0.070	0.061
	(1.262)	(1.337)	(0.505)	(0.459)
PROFITVOL	-0.059	0.015	-0.074	0.043
	(1.039)	(1.129)	(1.197)	(0.751)
INTCOV	0.000	-0.000	0.000	-0.000
	(1.286)	(0.768)	(1.513)	(0.739)
TANGIBILITY	-0.023*	-0.001	-0.022	0.027
	(1.650)	(0.141)	(1.461)	(1.416)
PENSION ASSET	-0.024*	-0.009*	-0.015	0.008
	(1.799)	(1.818)	(1.010)	(0.316)
Number of Firm-Qtrs.	6,851	7,212	6,281	7,858
Adjusted R-squared	0.049	0.308	0.073	0.493
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes